Eggen S, Natvig B: Concurrence of torus mandibularis and torus palatinus.

Abstract. Analysis of the concurrence of torus mandibularis and torus palatinus among altogether 2010 dental patients, using the test of independence, revealed that the concurrence was statistically significant among women ($P < 0.01$), but not among men. A tentative hypothesis to explain the sexual dimorphism of the parameter combined occurrence of the two characters was proposed.

Although having been the subject of numerous studies torus mandibularis (TM) and torus palatinus (TP) are not fully understood and explained. King & King (1) maintained that the variation in prevalence continues to remain a mystery. Ossenberg (2) said that TM and TP are two of the most controversial and poorly understood of skeletal traits. And recently Haugen (3,4) pointed out that there are diverging conclusions about whether the two characters are genetically correlated or are independent morphological units.

Previous papers described the variation of TM (5,6) and TP (7) among two patient groups, altogether 2010 individuals native to two different regions in Norway, the Lofoten Islands and the Gudbrandsdalen Valley. In the same patient materials the purpose of the present study was to analyze the concurrence of the traits.

STUDY POPULATIONS AND METHODS

Consecutive patients reporting for dental treatment in two private clinics were examined during the second half of 1954 and the first half of 1955 (Lofoten), and during the second half of 1955 and the first half of 1956 (Gudbrandsdalen). Recent residents and persons under 10 yr of age were not included in the investigation. A series of clinical variables was recorded in the dental chair by one examiner (S.E.) on a specially prepared form.

Tori

The existence of TM and TP was ascertained by visual inspection ad palpation, and assessed in 3 categories, small, medium, and large, according to criteria previously defined (6,7). Because of low frequency of the large and medium expressions the tori were regarded as either present or absent during the statistical analysis. The prevalence rates are presented in Table 1.

Statistics

To analyze the concurrence of TM and TP we used the test of independence (8). As null hypothesis we put

H_0: There is no connection between the presence of TM and TP.

The material was didided into blocks by sex, residence, and the 5 age classes 10-19, 20-29, 30-39, 40-49, 50~70 yr, altogether 20 blocks. The hypothesis was tested in each of the 20 blocks and in interesting combinations of blocks.

RESULTS

Table 2 shows the blocks and combination of blocks where H_0 is to be rejected. In Lofoten the age class 10-19 yr showed significant concurrence of the traits in women ($P < 0.05$) and in men and women combined ($P < 0.05$), but when combining the age classes the concurrence did not reach the 5% level of significance in either of the genders. In Gudbrandsdalen one age class (20-29 yr) exhibited a significant concurrence among men ($P < 0.05$) and in men and women combined ($P < 0.05$), whereas one (30-39 yr) showed a significant concurrence among women ($P < 0.01$) and in men and women combined ($P < 0.01$). In Gudbrandsdalen as a whole, and in Lofoten and Gudbrandsdalen as a whole, the concurrence was clearly significant ($P < 0.01$). When taking the sexes separately, however, the concurrence between TM and TP was significant among women in Gudbrandsdalen ($P < 0.01$) and among women as a whole ($P < 0.01$), but not among men.

DISCUSSION

Haugen (4) found low prevalences and low or non-existent correlation between the occurrence of TM and TP in a patient material from the Oslo area. However, looking at the problem from another angle he showed that the probability of finding a mandibular torus in a person bearing a palatine one was more than twice as high as in a person without the trait, and vice versa. He felt that such considerations make it difficult to reject the notion that there must after all be some causal relationship between the occurrence of the two tori.

Indeed, the present analysis corroborated this opinion, giving a clear concurrence between the presence of the traits when the whole material was taken together ($P < 0.01$) (Table

2). The lack of statistically significant concurrence in Lofoten when combining age classes may presumably have been influenced by the relatively low prevalence of TM in that area (Table 1).

And the lack of significant findings in the oldest age classes may have been affected by the decreasing tendency of the presence of both characters with age (6,7), and relatively low numbers of older individuals (Table 1).

The appearance of a statistically significant concurrence of TM and TP among women ($P < 0.01$) but not among men (Table 2) may seem enigmatic. Such sexual dimorphism of the parameter combined occurrence of the two traits may, however, have something to do with the diverging conclusions previously reported (3,4).

In previous papers it was suggested that each of the two characters seemed likely to arise on an underlying multifactorial continuity "liability", with a threshold separating affected and non-affected individuals (7,9), multifactorial meaning caused by many genes and environmental factors (10,11). Phenotypically, however, the traits were shown to behave differently when related to some defined variables such as age of onset and functional stress, indicating that TM and TP do not directly seem to be biologically equivalent characters wholly sharing a common morphogenetic background (7). It was particularly called attention to the circumstance that cited studies of 11 different living populations, altogether 15156 individuals, revealed a much higher prevalence of TP among women than among men, the actual ratio being 1.7:1 on the average. It was concluded that TP seems to be sex-influenced with at least part of the genetic determinants of the liability residing on the X chromosome (7). This deduction is similar to the hypothesis proposed by Kari & Alvesalo (12). In contrast, the sexual patterns of occurrence of TM did not indicate any X-linkage of the liability (7).

On this basis, at the risk of oversimplifying the problem, a tentative hypothesis to explain the sexual dimorphism of the parameter combined occurrence may be outlined as follows. Suppose that the genetic predisposition to TP includes syntenic loci on an X chromosome. Then let a woman exhibit a present TM. Consequently, since women are equipped with

two X chromosomes, this particular woman ought to have a greater chance at the same time to possess a TP predisposing one (and the trait) than has a man with TM, carrying one X chromosome.

Anyhow, the present observations revealed a statistically significant concurrence of TM and TP among women ($P < 0.01$), but no significant concurrence in men.

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Table 1. Prevalence rates for torus mandibularis (TM) and torus palatinus (TP) by sex, age, and residence.

	Age yr	n	With TM %	With TP %
Lofoten				
Men	10-19	97	16.5	30.9
	20-29	167	15.6	38.9
	30-39	125	20.8	32.0
	40-49	79	11.4	31.6
	50~70	86	10.5	24.4
	Total men	554	15.5	32.7
Women	10-19	138	11.6	37.0
	20-29	239	8.8	45.2
	30-39	129	14.7	45.0
	40-49	73	9.6	50.7
	50~70	48	2.1	37.5
	Total women	627	10.3	43.4
Gudbrandsdalen				
Men	10-19	109	25.7	15.6
	20-29	87	36.8	28.7
	30-39	63	28.6	33.3
	40-49	48	27.1	27.1
	50~70	55	23.6	18.2
	Total men	362	28.7	23.7
Women	10-19	122	29.5	28.7
	20-29	131	31.3	45.8
	30-39	94	21.3	38.3
	40-49	55	25.5	54.5
	50~70	65	20.0	38.6
	Total women	467	26.6	39.8

Table 2. Levels of significance for concurrence of torus mandibularis and torus palatinus.

		Age, yr					Age classes combined	
		10-19	20-29	30-39	40-49	50~70	n	
Lofoten	Men	N.S.	N.S.	N.S.	N.S.	N.S.	554	N.S.
	Women	<0.05	N.S.	N.S.	N.S.	N.S.	627	N.S.
	Men and women	<0.05	N.S.	N.S.	N.S.	N.S	1181	N.S.
Gudbrandsdalen	Men	N.S.	<0.05	N.S.	N.S.	N.S.	362	N.S.
	Women	N.S.	N.S.	<0.01	N.S.	N.S.	467	<0.01
	Men and women	N.S.	<0.05	<0.01	N.S.	N.S.	829	<0.01
Lofoten and	Men	N.S.	N.S.	N.S.	N.S.	N.S.	916	N.S.
Gudbrandsdalen	Women	N.S.	N.S.	<0.01	N.S.	N.S	1094	<0.01
combined	Men and women	<0.05	N.S.	<0.05	N.S.	N.S.	2010	<0.01